

a housing dimensioned for at least partial insertion into said insertion port, said housing including at least one mechanical feature that is sensible by said handheld video game platform to cause said switch to select said first voltage level instead of said second voltage level;

an electrical connector disposed within said housing, said electrical connector including at least one contact that receives said selected applied first voltage level; and

at least one active device disposed within said housing and electrically coupled to said contact, said active device being powered by said applied first voltage level.

B1 65. The cartridge of claim 64 wherein said first voltage level comprises 3.3 volts dc and said second voltage level comprises 5 volts dc.

66. The cartridge of claim 64 wherein said at least one active device comprises a circuit for coupling to a memory bus and to a general purpose bus.

67. The cartridge of claim 64 wherein the memory bus provides a 32-megabyte memory address space and the general purpose bus provides a 64 kilobyte address space.

68. The cartridge of claim 64 wherein the handheld video game platform switch is coupled to a dc-to-dc converter, and said cartridge electrical connector contact couples to said dc-to-dc converter through said switch.

69. The cartridge of claim 64 wherein said handheld video game platform includes first and second CPU cores for alternative activation in response to said switch, and said active device interoperates with said second core.

B1 70. The cartridge of claim 64 wherein said first CPU core has an 8-bit data path and said second CPU core has a 32-bit data path, and said memory cartridge active device is adapted for operation with said 32-bit data path.

71. The cartridge of claim 64 wherein said housing has a notch disposed thereon that is received within said insertion slot, said notch causing said switch not to select said second voltage level when said cartridge is inserted into said slot.

72. The cartridge of claim 64 wherein said connector provides an 8-bit-wide multiplexed bus and said at least one active device includes at least one random access memory device and at least one read only memory device connected to said bus.

73. The cartridge of claim 64 wherein the connector includes first and second chip select lines and said at least one active device includes a first memory device coupled to said first chip select line and a second memory device coupled to said second chip select line.

74. The cartridge of claim 64 wherein said connector includes pins 6 through 29 that are coupled to a 24-bit address bus.

31 75. The cartridge of claim 64 wherein the active device provides 32-bit-wide data to said handheld video game platform over a 16-bit-wide data path, said active device transmitting said 32-bit-wide words over said 16-bit-wide data path in two 16-bit half-words.

76. The memory cartridge of claim 64 wherein the connector has 32-pins including a multiplexed address/data bus provided on pins 6-29.

77. The memory cartridge of claim 64 wherein pins 6-21 provide address lines A0-A15.

78. The memory cartridge of claim 64 wherein said at least one active device comprises a read only memory and a random access memory both coupled to the same

plurality of connector pins, said read only memory using said plurality of connector pins as most significant bit address pins, said random access memory using said same plurality of connector pins as dedicated data pins.

79. The memory cartridge of claim 64 wherein said active device includes an interrupt request circuit that generates an interrupt request and provides said interrupt request to said handheld video game platform via said connector.

80. The memory cartridge of claim 64 wherein said active device includes a general purpose memory and a multiplexed bus converter.

81. The memory cartridge of claim 64 wherein said handheld video game platform provides an address space, and said at least one active device occupies, through said connector, addresses 0E00FFFF hex through 08000000 hex in said address space.

82. The memory cartridge of claim 64 wherein said cartridge active device provides plural wait state areas.

83. The memory cartridge of claim 82 wherein said plural wait state areas are configured to provide wait state cycles of 2, 4 and 8, respectively.

84. The memory cartridge of claim 82 wherein said plural wait state areas are configured to provide one wait state cycle each.

85. The memory cartridge of claim 82 wherein said plural wait state areas are configured to provide any of the following wait state cycles: 2, 3, 4 or 8.

86. The memory cartridge of claim 64 wherein said connector includes a clock pin having a clock signal thereon, said clock signal having programmable clock signal frequencies of about 4 MHz, about 8 MHz and about 16 MHz, wherein said at least one active device provides clock frequency programming information to said handheld video game platform to select one of said programmable clock signal frequencies.

Sub. D<sup>3</sup> 87. A pluggable memory cartridge for use in a system for playing video games by displaying graphical information based at least in part on user interaction provided through operation of at least one user-manipulable control, said system including a main unit having a cartridge insertion port that receives said pluggable memory cartridge, said main unit including an object attribute memory (OAM) storage, a color palette random access memory storage and a video random access memory storage, said memory cartridge including:

a housing dimensioned to be at least partially inserted into said port;

an electrical connector that electrically connects said cartridge to the main unit;  
and

at least one non-volatile memory device disposed within said housing, said non-volatile memory device being electrically connected to said electrical connector, said memory device storing executable instructions for:

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- (a) writing up to 128 different 48-bit moving object definitions to the object attribute memory (OAM) storage;
  - (b) writing up to 512 different 15-bit color values to the color palette random access memory storage;
  - (c) writing at least one of moving object definitions, background character definitions and bitmapped graphics to the video random access memory storage; and
  - (d) generating a game display that is responsive to said user-manipulable control and is based at least in part on the contents of the object attribute memory storage, the color palette random access memory storage, and the video random access memory storage.

Sub C3 88. The system of claim 87, wherein said memory cartridge non-volatile memory device stores instructions controlling storage, within said video random access memory storage, of bitmapped color information for the simultaneous display of up to 32,768 different colors.

89. The system of claim 87, wherein said memory cartridge non-volatile memory stores instructions that control reference to the color palette random access memory as a color lookup table for bitmapped graphics stored in said video random access memory storage to provide simultaneous display of up to 256 different colors.

90. The system of claim 87, wherein said memory cartridge non-volatile memory stores instructions that address the video random access memory storage beginning at address 06000000h.

B1 91. The system of claim 87, wherein said memory cartridge non-volatile memory stores instructions that access two allocated two frame buffers in the video random access memory storage to provide full motion video.

92. The system of claim 87, wherein said memory cartridge non-volatile memory stores instructions that specify up to 128 different moving object definitions providing moving object characters of up to 12 different sizes.

93. The system of claim 87, wherein said memory cartridge non-volatile memory stores instructions that write rotation/scaling parameters to the object attribute memory storage.

94. The system of claim 87, wherein the memory cartridge non-volatile memory stores instructions that write mosaic information to the object attribute memory storage.

95. The system of claim 87, wherein the memory cartridge non-volatile memory stores instructions that control display of plural display windows simultaneously.

B1 96. The system of claim 87, wherein the memory cartridge non-volatile memory stores instructions that control the scrolling of plural display windows independently.

97. The system of claim 87, wherein the memory cartridge non-volatile memory stores instructions that control the rotation of plural display windows independently.

98. The system of claim 87, wherein the memory cartridge non-volatile memory stores instructions that control the alpha blending of plural display windows independently.



99. The system of claim 87, wherein the memory cartridge non-volatile memory stores instructions that control the fade-in/fade-out of plural display windows independently.

100. The system of claim 87, wherein the memory cartridge non-volatile memory stores instructions that control the upper-left and lower-right display portions of plural display windows independently.

B1 101. The system of claim 87, wherein the memory cartridge non-volatile memory stores instructions that control performance of arithmetic operations on two selected surfaces and processing for up to 16 levels of semi-transparency.

102. A memory cartridge for a video game system having a memory cartridge insertion port, said memory cartridge comprising:

a housing dimensioned to be at least partially inserted into said memory cartridge insertion port; and

a least one memory device disposed in said housing, said memory device storing at least one executable instruction for writing a 16-bit value to a predetermined memory location, said 16-bit value having:

a bit position 00 specifying vertical blanking interval status,

a bit position 01 specifying horizontal blanking interval status,

a bit position 02 specifying vertical counter matching or non-matching,  
a bit position 03 specifying whether vertical blanking interval interrupts are  
enabled;  
a bit position 04 specifying whether horizontal blanking interval interrupts  
are enabled; and  
a bit position 05 specifying whether vertical counter matching interrupts are  
enabled.

103. The system of claim 102, wherein the predetermined memory location is at  
address 004h.

104. A memory cartridge for a video game system having a memory cartridge  
insertion port, said memory cartridge comprising:

a housing dimensioned to be at least partially inserted into said memory cartridge  
insertion port; and

a least one memory device disposed in said housing, said memory device storing  
at least one instruction that writes a 16-bit value at a predetermined memory location,  
said 16-bit value having:

a value at bit position 03 specifying whether vertical blanking interval  
interrupts are enabled;

a value at bit position 04 specifying whether horizontal blanking interval interrupts are enabled; and

a value at bit position 05 specifying whether vertical counter matching interrupts are enabled.

105. The system of claim 104, wherein the predetermined memory location is at address 004h.

106. A memory cartridge for a video game system having a memory cartridge insertion port, said memory cartridge comprising:

131 a housing dimensioned to be at least partially inserted into said memory cartridge insertion port; and

a least one memory device disposed in said housing, said memory device storing at least one instruction that writes a 16-bit word at a predetermined memory location including:

a three-bit background mode specifier to the bit positions 00-02 of said mode specifier including:

a display frame selector bit at bit position 04 that selects between two different frame buffers;

a control bit at bit position 05 that selects whether to render objects during horizontal blanking intervals; and

a control bit at bit position 06 that selects between one-dimensional and two-dimensional object character mapping;  
values at bit positions 08-12 that select display of four different background screens and display of moving objects;  
values at bit positions 13-14 that select display of two different windows; and  
values at bit position 15 that select display of an object window.

107. The system of claim 106, wherein the predetermined memory location is at address 0000h.

B1 108. A memory cartridge for a video game system having a memory cartridge insertion port, said memory cartridge comprising:

a housing dimensioned to be at least partially inserted into said memory cartridge insertion port; and

a least one memory device disposed in said housing, said memory device storing at least one instruction that upon execution effects a write of a 16-bit display instruction to a predetermined location, said 16-bit display instruction including:

a three-bit background mode specifier at bit positions 00-02 that determines background mode;

a display frame selector bit at bit position 04 that selects between two different frame buffers;

a control bit at bit position 05 that selects whether to render objects during horizontal blanking intervals;

a control bit at bit position 06 that selects between one-dimensional and two-dimensional object character mapping;

a value at bit positions 08-12 that selects display of four different background screens and display of moving objects;

a value at bit positions 13-14 that selects display of plural windows; and

a value at bit position 15 that selects display of a moving object window.

109. The system of claim 108, wherein the predetermined memory location is at address 0000h.

110. A memory cartridge for a video game system having a memory cartridge insertion port, said memory cartridge comprising:

a housing dimensioned to be at least partially inserted into said memory cartridge insertion port; and

a least one memory device disposed in said housing, said memory device storing at least one instruction that writes a 16-bit value to location 008h or 00Ah, said 16-bit value including:

a two-bit priority specification at bit positions 00-01 specifying one of four priority levels;

a two-bit character base block at bit positions 02-03 specifying a character base block value;

a mosaic enable/disable flag at bit position 06;

a color mode selector at bit position 07 that selects between a 16 color, 16 palette color mode and a 256 color, one palette color mode;

a screen base block at bit positions 08-12; and

a screen size specifier at bit positions 14-15.

131 111. A memory cartridge for a video game system having a memory cartridge insertion port, said memory cartridge comprising:

a housing dimensioned to be at least partially inserted into said memory cartridge insertion port; and

a least one memory device disposed in said housing, said memory device storing at least one instruction that:

(a) selects a mosaic object display mode; and

(b) effects a write of a 16-bit mosaic control value to an address 04Ch, the mosaic control value including a background character mosaic horizontal size in bit positions 00-03, a background character mosaic vertical size in bit positions 04-07, a moving object character mosaic horizontal size in bit positions 08-11 and a moving object character mosaic vertical size in bit positions 12-15,

wherein the mosaic sizes specify how many dots in an original character should be replaced by a virtual character.

112. A memory cartridge for a video game system having a memory cartridge insertion port, said memory cartridge comprising:

a housing dimensioned to be at least partially inserted into said memory cartridge insertion port; and

a least one memory device disposed in said housing, said memory device storing at least one instruction that controls rotation and/or scaling, said instruction causing data to be written to at least one rotation/scaling control register, said data including:

a 12-bit value specifying an x-coordinate reference starting point;

a 12-bit value specifying a y-coordinate reference starting point;

a 16-bit value specifying the distance of movement in the x direction; and

a 16-bit value specifying the distance of movement in the y direction.

113. A memory cartridge for a video game system having a memory cartridge insertion port, said memory cartridge comprising:

a housing dimensioned to be at least partially inserted into said memory cartridge insertion port; and

a least one memory device disposed in said housing, said memory device storing at least one instruction that effects a write of a 16-bit value to location 048h, said value including:

bit positions 00 through 04 specifying whether to display any or all of four background displays and a moving object display in a first display window;

31 a bit at bit position 05 specifying whether to enable color special effects within the first display window;

bits at bit positions 08-12 specifying whether to display any or all of the four background displays and the moving object display within a second display window different than the first display window; and

a bit at bit position 13 specifying whether to enable color special effects within the second window.

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